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Congenital Cardiology Solutions

THREE-DIMENSIONAL ECHOCARDIOGRAPHIC ASSESSMENT OF THE LONGITUDINAL TRICUSPID VALVE CHANGES ASSOCIATED WITH TRICUSPID REGURGITATION IN HYPOPLASTIC LEFT HEART SYNDROME

Poster Contributions
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Background: Increasing tricuspid regurgitation (TR) is an important risk factor for morbidity and mortality in children with hypoplastic left heart syndrome (HLHS). We have previously identified an association between TV tethering at pre-stage 1 surgical procedure and later TR in HLHS. Leaflet adaptation to tethering forces by leaflet expansion has been demonstrated in animal studies. We hypothesized that TV adaptation to TV tethering and chronic volume load would affect development of TR between stage 1 and stage 2 surgical palliation.

Methods: Infants with HLHS were assessed pre-stage 1 and pre-stage 2 surgical procedures. Two-dimensional echocardiography was used to measure RV fractional area change (FAC), RV sphericity index (SI), RV end-diastolic area (RVEDa - indexed to BSA) and the degree of TR. Three-dimensional echocardiography was used to extract {x, y, z} spatial coordinates to calculate TV leaflet and annulus area, TV tethering and prolapse volumes. Patients were divided into 2 groups, based on degree of TR pre-stage 2, for comparison at each surgical stage, as well as longitudinally between stages.

Results: Of 21 infants, 8 had moderate TR pre-stage 2 (group A) and 13 had mild TR (group B). Each group had similar findings pre-stage 1 with no difference in RV size, function or shape, or in TV size and tethering parameters. On longitudinal assessment from stage 1 to stage 2, both groups showed progressive increase in TV leaflet and annulus area, TV tethering volume, with no change in indexed RV size, FAC or SI. However, at pre-stage 2, group A had larger TV leaflet area (11.1 vs. 9.8 cm2/m2; P=0.05), annulus area (10.3 vs. 8.7 cm2/m2; P<0.05) and perimeter (21.5 vs. 19.4 cm/m2; P=0.09), compared to group B with no significant difference in RV size, shape or function. In Group A TV prolapse volume was also greater (0.10 vs. 0.02 mL/m2; P<0.05) whilst tethering volume was no different

Conclusion: Patients who developed significant TR at pre-stage 2 had an exaggerated increase in TV annulus and leaflet size as well as progressive increase in leaflet prolapse. The potential role of TV maladaptation to early tethering forces in the development of TR in HLHS warrants further investigation.